

**REVIEW OF U.S. ARMY CORPS OF ENGINEERS
GREAT LAKES AND MISSISSIPPI RIVER INTERBASIN STUDY—BRANDON ROAD (GLMRIS-BR)
APPENDIX D – ECONOMIC ANALYSIS AND PORTIONS OF MAIN REPORT**

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TABLE OF CONTENTS

1. Introduction	3
2. GLMRIS Alternatives	4
3. Role of Transportation Cost Savings in the Corps Process	5
4. Cargo Traffic at BRLD	9
5. Traffic Forecasts	11
6. Analysis of Corps Transportation Cost Increases	19
7. Alternative Cost Estimates Based on Rail Revenues	24
8. Alternative Cost Savings Based on Shipper and Receiver Responses.....	26
9. Transportation Cost Findings	33
10. Regional Economic Impacts	35
11. Alternative Selection and Evaluation Process	36
12. Summary and Conclusions	37

TABLES

1. BRLD Traffic	9
2. USACE Target Tonnage by Commodity	10
3. Authors Revised Tonnage Estimate	13
4. BRLD Traffic from LPMS	17
5. Increases in Transportation Costs by Commodity with Lock Closure	19
6. Comparison of Railroad Revenue per Ton to GLMRIS Cost Savings per Ton	23
7. Alternative Cost Savings Based on Rail Costs	25
8. Transportation Cost Impacts Associated with Shipper and Receiver Actions ...	34
9. Transportation Cost Comparison with BRLD Closure	35
10. Critical Assessment of GLMRIS-BR Evaluation Matrix	40

FIGURES

1. National Intermodal Commodity Traffic Trends	15
2. Illinois Waterway System Traffic Trends	16

1. INTRODUCTION

The spread of aquatic nuisance species (ANS) between the Great Lakes and the Mississippi watersheds has been a concern for the last decade or more. Of particular concern has been movement of Asian Carp up the Illinois River System towards Lake Michigan. In a series of laws, Congress directed the U.S. Army Corps of Engineers (USACE or Corps) to conduct and then expedite a feasibility study of options to prevent the spread of ANS between the Great Lakes and Mississippi River Basin through the Chicago Area Waterway System (CAWS). ¹The Corps refers to the required study as the Great Lakes and Mississippi River Interbasin Study (GLMRIS). In January 2014, the corps published an initial GLMRIS report² that evaluated eight alternatives, including among others, a mid-system hydraulic separation. That alternative involved the construction of a physical separation at Stickney (MP 316) on the Chicago Sanitary and Ship Canal and at Alsip (MP 316) on the Calumet-Sag Channel. These separations would preclude direct waterborne movement of ANS and cargo from one side to the other. The 2014 GLMRIS Report did not make any recommendation among the alternatives considered.

The Corps subsequently conducted a follow-up GLMRIS study focusing specifically on possible measures at the Brandon Road Lock and Dam (BRLD) as a single point to control the upstream movement of ANS, including Asian Carp, toward the Great Lakes.³

In August 2017, the USACE issued a new Great Lakes and Mississippi River Interbasin Study—Brandon Road-Draft Integrated Feasibility Study and Environmental Impact Statement, Will County, Illinois (GLMRIS---Brandon Road)⁴ It evaluates a series of alternatives ranging from no new federal action to lock closure at the Brandon Road Lock and Dam. This is located at MP 286

¹ See GLMRIS- Brandon Road Draft Report, pp 2-3 available at http://glmr.is.anl.gov/documents/docs/brandon-rd/GLMRIS-BR_Draft_Report.pdf

² See GLMRIS Report (2014) <http://glmr.is.anl.gov/glmris-report/>

³ See Brandon Road Study Area, <http://glmr.is.anl.gov/brandon-rd/study/>

⁴ http://glmr.is.anl.gov/documents/docs/brandon-rd/GLMRIS-BR_Draft_Report.pdf

on the Des Plaines River immediately south of the City of Joliet, Illinois---it is about 30 river miles west of the locations proposed in the 2014 studies.

Dr. Taylor and Mr. Roach have been retained by the Michigan Department of Attorney General to review pertinent parts of the latest USACE GLMRIS Report related to commercial cargo navigation impacts, particularly the estimated impacts of what the Corps describes as Lock Closure. This review follows and builds upon the author's previous involvement in this issue which began in 2009. Our approach involves four major components. First is to review the methods used by the Corps to evaluate transportation cost savings. Second is to assess the reasonableness of the traffic forecasts. Third is to assess the Corps findings regarding transportation cost savings. Fourth, if warranted, is to develop alternative traffic and transportation savings scenarios. Within the Corps conceptual framework transportation cost savings are a critically important part of the alternative evaluation and selection process and it is imperative that correct values be utilized if that framework is used.

2. GLMRIS ALTERNATIVES

The 2017 GLMRIS-BR Report identifies six alternatives:

- No New Federal Action
- Nonstructural Alternative
- Technology Alternative—Electric Barrier
- Technology Alternative—Complex Noise
- Technology Alternative—Complex Noise with Electric Barrier
- Lock Closure Alternative

The report states that “the tentatively selected plan is the Technology Alternative—Complex Noise with Electric Barrier, which includes the following measures: nonstructural measures, complex noise, water jets, engineered channel, electric barrier, flushing lock, boat launches and mooring area.” All of the alternatives are described in detail and justification is provided for the selection of the “tentative” alternative. The Corps states that “the tentatively selected plan is the alternative that reduces the risk of Mississippi River Basin ANS establishment in the Great

Lakes Basin to the maximum extent possible while minimizing impacts to waterway uses and users.” The Corps process identified the Lock Closure Alternative as the most effective at preventing ANS establishment in the Great Lakes but rejected the alternative because it estimated that lock closure would “cost” \$328 million a year in terms of additional transportation and safety costs.

3. ROLE OF TRANSPORTATION COST SAVINGS IN THE CORPS PROCESS

The key economic value used in the Corps’ analysis process is “Transportation Cost Savings.” Simply described, this involves shift of mode costs for commodity movements having the same origin and destination that incur a cost increase by shifting from their current water routing to an overland mode (e.g., rail, truck). In this case lost transportation cost savings are the difference in water transportation costs and the costs of the least expensive alternative route.⁵

From our previous work in 2014, we have included some excerpts from an earlier Corps report.⁶

- “Transportation rate savings can most easily be defined as the reduction in economic cost of transporting freight over the waterway compared to transporting it by land. “⁷ The process generally assumes that cargo origins and destination remain the same.
- “This analysis assumes that complete hydrologic separation results in all affected movements leaving the inland waterways, so all NED⁸ benefits are lost.”⁹
- “CTR¹⁰ estimated transportation cost from ultimate origin to ultimate destination by the current water mode and by the least cost alternative land routing. The differential between water route and least cost alternative routing is the transportation rate savings.”¹¹

⁵GLMRIS-BR, Appendix D, Economic Analysis, Page D-53.

⁶ Taylor-Roach, 2014 Report. Page 9.

⁷ 2014 GLMRIS Report. Page D-639.

⁸ National Economic Development Benefits

⁹ 2014 GLMRIS Report. Page D-698.

¹⁰ USACE contracted with The University of Tennessee, Center for Transportation Research (CTR) to determine transportation cost savings.

¹¹ 2014 GLMRIS Report. Page D-694.

“Transportation cost savings” is an awkward and confusing choice of words. It is made even more so when the term “lost transportation cost savings” is used. The Corps also seems to struggle with how to present the information. In some places they use the term “average annual transportation cost savings” and in other places “increase in average transportation costs.”¹² The latter seems preferable since the term usually just means the additional costs associated with switching from barge transport to overland mode transport.

The Corps conducts its analysis using a set of models that appear to be used primarily for studies related to waterway improvements such as lock expansions. It is important to note that very few transportation details are provided about the use and implementation of the model(s). There are no examples of origins and destinations, model assumptions, or before and after mode and rate calculations--- just output from the models used. It is unclear whether these models and the inputs used are appropriate for the purposes of this study.

The results of the Corps exercise indicate that there would be \$318.7 million in lost transportation cost savings (also stated as Costs of Impacts to Navigation in the GLMRIS Alternative Evaluation Matrix¹³) resulting from lock closure. The implication is that shippers would incur these additional costs since cargo is shifted from economical barge transportation to more expensive overland modes. This value is used throughout the analytical process as the principal component for which the lock closure alternative is measured. An additional amount of \$9.5 million¹⁴ was added to the navigation cost impacts to apparently account for additional deaths, injuries and property damage resulting from the shift to alternative modes---- this results in “NED”¹⁵ costs of \$328.2 million. As noted later in this report, our analysis indicates that these numbers are far too high – in fact we conclude later that this number is overstated by a factor of 2.5 times.

¹² GLMRIS-BR, D-81 and elsewhere.

¹³ GLMRIS-BR Main Report. Page 378 and elsewhere.

¹⁴ We were unable to locate the exact source of \$9.5 million---no such value is given in Appendix D where safety is discussed. Page 372 of the main report gives \$19.4 million in additional safety impacts with the LCA alternative.

¹⁵ National Economic Development.

It is also important to recognize that lost transportation cost savings does not mean that transportation rates would actually increase by that amount if water transportation ended or was disrupted in some manner. It only means that shifting from barge transportation to overland transportation for the same cargo origin/destination points would result in additional costs. The Corps analytical process assumes that cargo would continue to move to and from existing locations. In fact, this would be unlikely to happen in the real world of commodity buyers and sellers and transportation providers. Major changes in transportation costs and services would likely result in different purchasing scenarios. Sourcing and transportation options would be assessed to determine the most competitive delivered price for a product or commodity. In addition, we believe the waterway mode would continue to be used for some of the traffic for at least a portion of the overall move.

Product resourcing and continued use of water transportation with a transload to a different mode of transportation (e.g., truck) at some point in the trip would result in transportation impacts significantly less than the lost transportation rate savings calculation. The Corps concept of lost transportation rate savings maximizes benefits associated with water transportation but bears very little relationship to before and after transportation costs. There is no way that shippers and receivers would pay \$318 million (about \$28/ton) in additional transportation costs to buy or sell the affected commodities. They will just make other arrangements in the transportation and commodities marketplace in order to remain competitive---as such, it is a meaningless number and not at all representative of what would happen. There would be additional costs but they would be far less than the Corps estimates.

We dwell on the issue of transportation cost savings because it is the principal determinant that the Corps uses in selecting an alternative for implementation. It is the reason that the Complex Noise with Electric Barrier Alternative was selected over the Lock Closure Alternative (LCA). The Lock Closure Alternative is better in every measure in the Corps Evaluation Matrix¹⁶ except for transportation cost impacts (defined in the Matrix as “Costs of Impacts to Navigation” and

¹⁶ GLMRIS-BR Main Report. Page ES-13 and elsewhere. See restated summary version of the evaluation matrix at the end of this report.

“Total NED Costs”). Importantly, the Lock Closure Alternative is the most effective alternative in terms of preventing ANS including Asian Carp from entering the Great Lakes Basin. It seems like the LCA should be selected on that basis alone. However, Lock Closure is also the least expensive in terms of construction and ongoing operating costs and it can be implemented sooner than the selected alternative---so, Lock Closure is less expensive, more effective and faster to implement. The downside is that the transportation sector would incur additional costs. That is why it is so important to have accurate and meaningful estimates of those impacts. We also note that in the Corps evaluation matrix that there are no costs considered for damages to the Great Lakes if Asian Carp or other ANS should become established. These damages could be enormous and would greatly exceed additional transportation costs incurred by the shipping community.

The issue of transportation cost savings playing such a prominent role in the decision making process is reinforced by the Corps statement that: “the tentatively selected plan is the alternative that reduces the risk of Mississippi River Basin ANS establishment in the Great Lakes to the maximum extent possible *while minimizing impacts to waterway uses and users*”¹⁷ (*Emphasis added*). This statement is compared to the Corps planning objective to: “prevent the upstream transfer of ANS from the MRB to the GLB through the CAWS in the vicinity of the BRLD through the planning period of analysis.”¹⁸ The emphasized addition seems to bias the study towards selection of an alternative that allows continued use of the waterway system. The use of transportation cost savings seems to be the basis by which this is accomplished.

Certainly, there will be additional transportation costs if the lock is closed since barge transportation for certain commodities tends to be less expensive than other forms of transportation. However, we believe the Corps approach to transportation cost savings is seriously flawed and greatly overstates the additional costs for shippers and receivers. This overstatement of costs is due both to unrealistically high traffic assumptions made by the Corps

¹⁷ GLMRIS-BR Report Brochure. Also restated slightly differently on page ES-1 of the main Report.

¹⁸ GLMRIS-BR Main Report. Page 45.

and alternative overland route cost estimates that are implausible and would not occur in the real world. The following sections will review the Corps traffic forecasts and their estimates of transportation cost savings.

4. CARGO TRAFFIC TRENDS AT THE BRANDON ROAD LOCK AND DAM

Table 1 shows trends in Brandon Road Lock and Dam traffic for selected years. The 2015 and 2016 tonnage data, highlighted in yellow, was not included in the GLMRIS-BR report. This data was obtained by the authors from the Lock Performance Monitoring System (LPMS) and is important because it shows significant traffic declines from the time period used by the Corps for their analysis.

This table shows that traffic declined during the recessionary period beginning in 2007 and has not recovered despite an improving and strong economy at the present time. Traffic between 2006-2016 declined by about 37 percent based on actual LPMS data. Not shown in Table 1 but contained in the GLMRIS report is 1994 year data which shows an even higher value of 19,238,000¹⁹ tons.

TABLE 1
BRANDON ROAD LOCK AND DAM TRAFFIC

Year	LPMS Traffic (millions of tons)	LPMS Barges (number)	WCS Traffic (millions of tons)
2000	16,940	10,600	15,526
2005	17,337	10,931	15,744
2006	17,812	11,038	14,184
2007	13,682	8,427	11,643
2008	12,665	7,587	11,313
2009	10,465	6,376	9,278
2010	10,010	6,090	9,109
2011	10,761	6,452	9,598
2012	11,089	6,641	9,830
2013	10,427	6,193	8,849
2014	12,588	7,552	11,339
2015	11,746	7,040	
2016	11,185	6,634	

¹⁹ GLMRIS-BR, Appendix D, Economic Analysis, Attachment 2. Page 11.

Source: Appendix D: Attachment 2. Pg. 11 for 2000-2014 values. Year 2015 and 2016 shown in yellow above are from LPMS but not included in the GLMRIS-BR report.

A significant and confusing issue in dealing with traffic is that information at BRLD and other locks comes from two different sources. The Lock Performance Monitoring System (LPMS) is “very accurate at counting barges but the tonnage in each barge is estimated by the lock operators.” The Waterborne Commerce System (WCS) “is very accurate in barge origin-destination information and barge loading; however, it does not identify how the barges are grouped in tows, and tonnage can be underreported.”²⁰

To further complicate matters, the Corps developed a third set of numbers, shown in Table 2, to account for the discrepancies between LPMS and WCS. They developed escalation factors for WSC data by commodity and averaged 2012-2014 to come up with a Target Tonnage²¹ value for the GLMRIS-BR study.

TABLE 2
USACE TARGET TONNAGE BY COMMODITY

Commodity	2012-14 Average Tons Target
Coal	1,732,835
Petroleum	1,626,255
Chemicals	1,334,498
Ores and Minerals	746,952
Crude Petroleum	419,638
Aggregates	1,409,335
Grains	396,339
Iron and Steel	2,370,987
All Others	1,460,961

²⁰ GLMRIS-BR. Page D-66.

²¹ GLMRIS-BR. Page D-67.

Total	11,497,800

Source: Page D-67

Target Tonnage is an average of adjusted WCS traffic for 2012, 2013, and 2014. The Target Tonnage is 11, 497,800 tons. This is about 1.5 million tons higher than the average WCS tonnage and aligns better with the LPMS although it is still about 110,000 tons greater than the LPMS average for those years. The Corps analysis is based on the Target Tonnage Number.

As stated previously, the GLMRIS-BR report does not include any statistical tonnage data beyond 2014 although LPMS information is currently available for 2015 and 2016. LPMS traffic declined by 6.7 percent from 2014 to 2015 and 4.8 percent from 2015 to 2016. Target Tonnage numbers should be based on the latest available information and that is not the case in the GLMRIS-BR report. The use of these higher traffic levels in the Corps analysis results in greater transportation impacts than is justified.

5. TRAFFIC FORECASTS

The Waterway Traffic Demand Report²² projects that BRLD traffic will grow from 12.05 million tons in 2020 to 12.2 million tons in 2030 and 12.4 million tons in 2040 after which it will remain constant until 2070 which is the end of the planning period²³---in other words traffic will be flat and only marginally higher in 2070 than the Corps Target Tonnage of 11.5 million tons.

A review of the Waterway Traffic Demand Projection Report is difficult given a complete absence of any tabular information related to the different commodity groups. There was a discussion of some of the commodities and an indication of specific commodity growth and index factors but no results were provided---only aggregate numbers for 2020, 2030, 2040 and 2070. Using the data provided by the Corps, it is impossible to determine how the different commodity groups would increase or decrease. Furthermore, there was absolutely no

²² GLMRIS-BR. Appendix D-Economic Analysis, Attachment 2-Waterway Traffic Demand Projections.

²³Ibid, page 23.

discussion about major commodity groups such as coal and little discussion about agricultural products.

The word coal was not even mentioned in the entire demand forecast report which is surprising given its importance as a waterway commodity. In fact, this commodity had by far the greatest increases in transportation costs estimated by the Corps. Over 26 percent of the \$318.7 million in increased cost is attributed to coal yet its future is not even discussed. This is surprising since coal has historically been the main commodity transported on the inland waterway system and coal is the second largest commodity group in the Corps 2012-14 Target Tonnage Table.

Further, coal has by far the greatest expected increase transportation costs (\$84,530,000) with lock closure. It is not mentioned in the forecast yet coal moving through the BRLD declined from 1.35 million tons in 2014 to 1.0 million tons in 2015 to 776,000 tons in 2016²⁴. Apparently coal was placed in the “Not Elsewhere Classified”²⁵ category because they could not find any indices for growth. If so, coal was then estimated to grow at the same rate as population in the greater Chicago area. This is clearly incorrect because coal production and utilization especially in the power generation sector is in major decline. As an example, DTE Energy, Michigan’s largest producer of electricity plans to close eleven coal fired plants by the early 2020’s.²⁶ As discussed later in this section, we also discovered that the coal fired NRG Romeoville power plant, located on the waterway system, plans to completely close by May 2018.

The traffic demand report indicates that U.S. steel and pig iron production has been in a long term downward production trend. It also notes that petroleum movement by barge is contingent on limited pipeline capacity and that major new pipeline projects are in the works. Other commodity volumes were relatively the same during this period. One of the growth commodities for the inland waterway system has been agricultural commodities but this has been a relatively small component of the BRLD traffic in part because of the urban geography

²⁴ See attached Table 3 for LPMS Brandon Road Lock and Dam Traffic; 1999-2016.

²⁵ Appendix D, Attachment 2, Waterway Traffic Demand Projections. Page 22

²⁶ Detroit Free Press, May 2017.

easterly of the lock and the fact that downbound movements from the Chicago area to the Gulf Coast and Lower Mississippi are some of the longest in the country.²⁷

We have reviewed the most recent available traffic trends as well as information contained in the Corps report and prepared revised estimates of traffic levels at the BRLD. Table 3 summarizes our revised estimates.

TABLE 3
AUTHORS REVISED TONNAGE ESTIMATES

Commodity	2012-14 Average Tons Target ²⁸	Revised Tonnage Estimate ²⁹
Coal	1,732,835	800,000
Petroleum	1,626,255	1,219,692
Chemicals	1,334,498	1,334,498
Ores and Minerals	746,952	746,952
Crude Petroleum	419,638	314,728
Aggregates	1,409,335	1,409,335
Grains	396,339	396,339
Iron and Steel	2,370,987	2,317,495
All Others	1,460,961	1,460,961
Total	11,497,800	10,000,000
Source	USACE	Authors

Our short to medium term view is that tonnage through the BRLD will be in the 10 million ton range and that any increases in other commodity traffic will be offset by declines in coal and petroleum traffic. This value is similar to recent tonnages shown in both the LPMS and the WCS. For example, in the LPMS, 2009 was 10,465,000 tons, 2010 was 10,010,000 tons, 2011 was 10,761,000 tons, and 2013 was 10,427,000 tons. The WCS values were even lower with less than 10,000,000 tons in most years since 2009. Our revised forecast reflects recent trends in coal³⁰ traffic which totaled only 776,000 LPMS tons in 2016—thus our estimate of 800,000 tons of coal traffic was actually greater than what occurred in 2016. Our assumption for coal may in

²⁷ GLMRIS-BR. Appendix D, Attachment 2, Page 20.

²⁸ GLMRIS-BR. Page D-67.

²⁹ Authors Estimate

³⁰ The coal category includes coal coke which is an important commodity on the waterway system.

fact be far too high. We discovered that the NRG Romeoville Power Plant closed units #1 & #2 in 2010, unit #3 closed in 2015 and the final unit #4 is scheduled to close by May of 2018. It is likely that the large drop in coal traffic in 2016 was caused by the closure of unit #3. Again, coal was not mentioned in any way in the Corps forecast. We also reduced the amount of petroleum and crude petroleum traffic based on the likelihood of additional pipeline construction³¹ that was mentioned in the Corps report. Other forecast values remained the same except for a small decrease in the iron and steel category.

A review was also undertaken of national trends in the use of the waterway system. Figure 1 shows traffic trends for the 2007-2016 period. This shows that nationwide, domestic waterway traffic declined from 622 million tons in 2007 to 548 million tons in 2016, again, despite a growing national economy since 2010. The two largest categories of traffic are coal and petroleum. Figure 1 shows that coal traffic is in steep decline dropping about 1/3 during this ten year period. Petroleum traffic remained about the same during this period but as noted earlier this traffic is very susceptible to the many new pipelines that are being planned or constructed. Also, as noted earlier, a growth area nationwide in waterway traffic is food and farm products but this commodity is relatively unimportant at the BRLD.

We also reviewed Illinois Waterway trends for this same period. Figure 2 shows similar trends---overall traffic of 41.1 million tons in 2007 decreasing to 37.6 million tons in 2016. These data support our revised tonnage estimates in Table 3 in that overall traffic continues to decline.

Our estimated traffic of ten million tons will be about half of the traffic that utilized the BRLD in 1994.³²The declining use of barge traffic is evident in any survey of the waterway system. Many of the former waterway terminals and businesses are closed, abandoned or converted to other uses. The authors made four on-site visits to survey the waterway system including two visits by boat. The last visit in October 2017 focused on the area from the junction of the Cal Sag Channel and the Sanitary and Ship Canal (MP303.4) to the area below the Brandon Lock and Dam downriver to Morris, Illinois. In both 2006 and 2010, we utilized 1998 charts of the Illinois

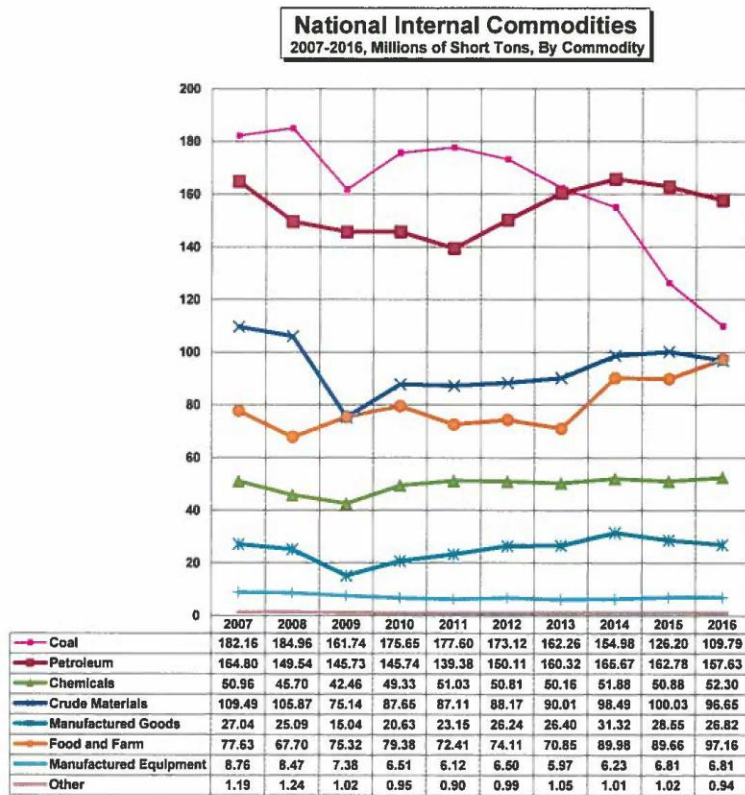
³¹ GLMRIS-BR. Appendix D: Attachment 2. Pages 19-20.

³²GLMRIS-BR. Pages D-47 & 48. 1994 traffic at BRLD was 19,238,000 tons.

Waterway System published by the U.S. Army Corps of Engineers. In October 2017, we utilized updated charts published in 2013. One striking observation was the fact that many of the terminals listed as shipping or receiving cargo on the 1998 charts were no longer in business. Many former shipping sites are now vacant lots or converted to other non-transportation uses. Our comparison of the 1998 charts and the 2013 charts quantified our observation in that the 1998 charts listed 350 terminals whereas the 2013 charts listed 303 terminals---a statistical decrease of 13 percent. We also noted that many of the terminals still listed in the 2013 charts are inactive, vacant, abandoned or converted to other uses.

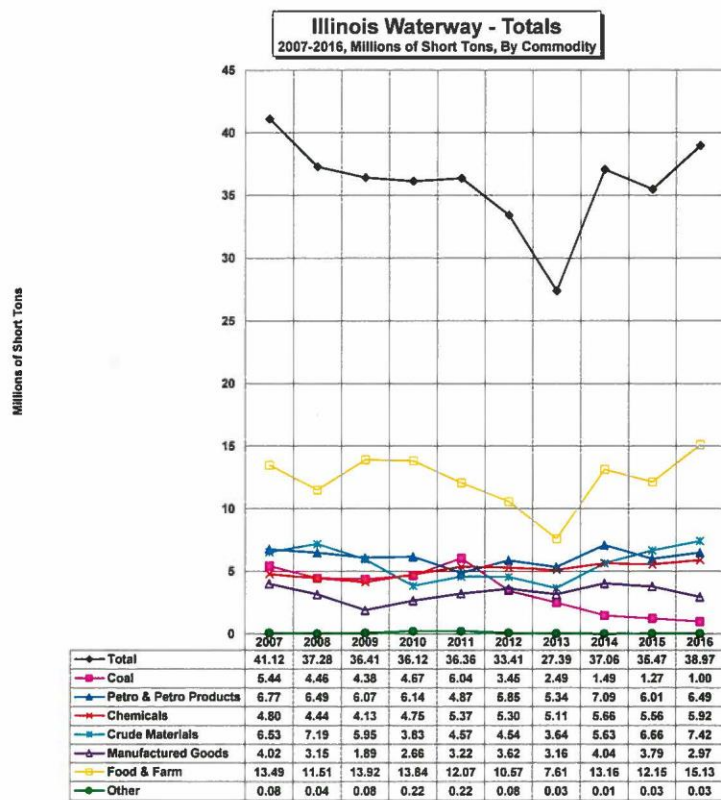
FIGURE 1
NATIONAL INTERMODAL COMMODITY TRAFFIC TRENDS

Millions of Short Tons



Source: USACE Waterborne Commerce Statistics Center

FIGURE 2
ILLINOIS WATERWAY SYSTEM TRAFFIC TRENDS



Source: USACE Waterborne Commerce Statistics Center

Table 4 summarizes the traffic by commodity at the Brandon Roads Lock over 10 years. The decline in coal traffic is notable.

TABLE 4
BRANDON ROAD LOCK AND DAM TRAFFIC FROM LPMS
1999-2016

Table 4

Brandon Road Lock and Dam Traffic

1999-2016

	CY2016	CY2015	CY2014	CY2013	CY2012	CY2011	CY2010	CY2009	CY2008
00 - All Units (Ferried Autos, Passengers, Railway Cars)	-	-	-	-	-	-	-	-	-
10 - All Coal, Lignite, and Coal Coke	776,174.00	1,001,211.00	1,350,771.00	1,064,400.00	1,179,120.00	1,622,706.00	1,599,200.00	1,575,933.00	1,725,583.00
20 - All Petroleum and Petroleum Products	1,895,496.00	3,899,400.00	2,457,247.00	1,944,544.00	2,399,770.00	1,553,955.00	1,383,032.00	1,362,687.00	1,469,148.00
30 - All Chemicals and Related Products	1,595,079.00	3,545,360.00	1,449,040.00	1,372,938.00	1,309,711.00	1,554,847.00	1,470,920.00	1,405,675.00	1,633,958.00
40 - All Crude Materials, Inedible, Except Fuels	3,820,570.00	3,798,116.00	3,557,136.00	3,213,748.00	3,174,748.00	3,703,640.00	3,556,997.00	4,469,186.00	5,126,246.00
50 - All Primary Manufactured Goods	2,465,000.00	2,918,223.00	3,186,289.00	2,254,592.00	2,471,811.00	1,932,124.00	1,297,033.00	976,623.00	1,694,843.00
60 - All Food and Farm Products	574,650.00	535,410.00	511,782.00	477,150.00	458,850.00	219,272.00	535,773.00	580,974.00	409,443.00
70 - All Manufactured Equipment & Machinery	37,636.00	52,175.00	26,670.00	34,415.00	51,255.00	147,470.00	141,420.00	81,929.00	75,850.00
80 - All Waste Material	4,700.00	4,200.00	23,900.00	29,941.00	32,900.00	17,400.00	19,415.00	6,400.00	3,100.00
90 - All Unknown or Not Elsewhere Classified - 90	13,400.00	31,500.00	25,600.00	34,500.00	10,900.00	9,217.00	6,400.00	6,390.00	27,055.00
	11,184,905.00	11,745,595.00	12,588,435.00	10,437,038.00	11,089,065.00	10,760,631.00	10,010,190.00	10,465,777.00	12,665,246.00

	CY2007	CY2006	CY2005	CY2004	CY2003	CY2002	CY2001	CY2000	CY1999
1,331,834.00	2,429,528.00	2,563,721.00	3,034,275.00	1,773,695.00	2,032,607.00	2,202,904.00	2,438,201.00	2,420,452.00	-
2,070,160.00	1,802,843.00	1,505,400.00	1,534,531.00	1,852,705.00	2,480,083.00	2,499,888.00	2,236,676.00	1,962,444.00	-
1,740,490.00	1,861,695.00	1,819,056.00	1,970,354.00	1,860,566.00	2,162,514.00	2,045,771.00	2,199,714.00	1,998,931.00	-
4,960,766.00	6,276,059.00	6,038,357.00	5,637,304.00	5,500,357.00	5,131,999.00	5,064,500.00	4,622,284.00	4,638,025.00	-
3,083,444.00	4,732,010.00	4,393,325.00	4,206,667.00	3,570,712.00	3,567,411.00	3,941,945.00	3,667,599.00	3,708,075.00	-
481,661.00	562,785.00	849,576.00	943,985.00	1,090,692.00	1,304,110.00	1,007,615.00	852,544.00	795,353.00	-
140,391.00	95,449.00	64,259.00	85,549.00	71,065.00	116,703.00	302,537.00	340,068.00	115,503.00	-
21,420.00	6,100.00	4,748.00	85,600.00	-	1,580.00	1,400.00	1,600.00	1,500.00	-
31,871.00	45,375.00	77,267.00	45,823.00	47,161.00	380,887.00	348,411.00	577,796.00	433,591.00	-
13,862,037.00	17,811,843.00	17,316,600.00	17,645,088.00	15,766,933.00	17,177,894.00	16,418,031.00	16,940,484.00	16,073,774.00	-

The transportation of bulk commodities such as those associated with barge and rail transportation is not expected to grow significantly. The federal Bureau of Transportation Statistics produces an annual report that forecasts freight traffic demand to 2045. The 2016 report³³ shows that barge traffic is expected to grow only 11 percent between 2016 and 2045. Rail is expected to grow only 9 percent and trucking is forecast to grow 34 percent.

The Congressional Research Service notes: “Some groups have countered industry requests for new lock construction based on traffic projections by noting that traffic has been flat or decreasing at some individual locks on high traffic portions of the inland waterway system. Observers, including former Corps employees, have also criticized previous projections of traffic increases by the Corps as overly optimistic.”³⁴

Another justification for the authors 10 million ton estimate as opposed to the Corps 11.5 million ton Target Tonnage is that the Target Tonnage value was based on an average of 2012-14 traffic that was adjusted. Since that time, 2015 and 2016 traffic values have become available and show that traffic decreased by 11.1 percent from 2014 to 2016, despite a strong upward trending national and regional economy. Arithmetically 11.5 million tons minus 11.1 percent results in a value of 10.15 million tons---very close to the 10 million ton value our analysis suggests.

There is ample justification for using 10 million tons as a base for the analysis. This is based on the most current information and recognizes that the two largest volume commodities on the waterway system are in decline---coal is being rapidly replaced by less expensive natural gas and renewable energy sources and the movement of petroleum products is expected to decline as the pipeline network expands. Other commodities may increase marginally but this increase will be offset by decreases in coal and petroleum traffic. Further, the U.S. economy is currently at the higher end of the economic cycle---GDP and the stock market are at record highs and unemployment levels are very low. Past history has shown that recessionary events will occur and this will almost certainly cause freight traffic tonnage levels to decline.

³³ U.S. Department of Transportation, Bureau of Transportation Statistics, Transportation Statistics Annual Report, 2016. Table 3-1.

³⁴ Congressional Research Service; Inland Waterways: Recent Proposals and Issues for Congress. May, 2013. Pg.19.

6. ANALYSIS OF CORPS TRANSPORTATION COST INCREASES

Table 5 provides the Corps estimate of Target Tonnage and Increased Transportation Costs. The Corps did not provide any information on cost per ton which is a common measurement of transportation cost, instead providing just total annual dollar estimates by commodity as shown in Column 3 of Table 5. Our calculation of cost per ton using the Corps own data is shown in column 4 and the values shown defy any reasonable explanation. The results imply that water transportation costs are \$27.72 per ton³⁵ less on average than an overland transportation mode. This is an extraordinarily high number, especially since many cargo shipments are local in nature and many are very low cost cargoes.

TABLE 5
INCREASES IN TRANSPORTATION COSTS BY COMMODITY WITH LOCK CLOSURE

Commodity	GLMRIS Report		Author's Calculation
	2012-14 Average Tons Target/1	Corps Increase In Transportation Cost2/	Increase per Ton Based on Corps Data3/
Coal	1,732,835	\$84,530,000	\$48.78
Petroleum	1,626,255	\$43,097,000	\$26.50
Chemicals	1,334,498	\$53,757,000	\$40.28
Ores and Minerals	746,952	\$31,958,000	\$42.78
Crude Petroleum	419,638	\$33,003,000	\$78.64
Aggregates	1,409,335	\$35,077,000	\$24.88
Grains	396,339	\$17,499,000	\$44.15
Iron and Steel	2,370,987	\$7,504,000	\$3.16
All Others	1,460,961	\$12,343,000	\$8.44
Total	11,497,800	\$318,770,000	\$27.72
Source	USACE	USACE	Authors

Source: 1/Table 24, Page D-67; 2/Table 30, Page D-86; 3/Calculations by authors. Column 3 divided by Column 2.

³⁵ The cost savings of \$27.72 would rise to \$34.10/ton if the iron and steel commodity (only \$3.16/ton) was removed from the calculation. It would rise even more to \$38.99/ton if iron & steel and "all other" commodities were removed.

The most blatant example of such unrealistic estimates is coal³⁶ transportation costs which are calculated to increase by \$48.78/per ton in the absence of the water mode. A review of transportation costs by the U.S. Energy Information Agency indicates average coal transportation costs by rail from all origins to all destinations were only \$19.13/ton in 2016³⁷. The highest rail cost from any coal producing region in the U.S. is \$21.60. In this example, the average delivered price of coal, which includes the cost of the coal itself, is \$40.22---thus, the actual cost of the coal at the mine cost \$21.09 and rail transportation cost \$19.13. The average includes large volumes of coal from the Powder River Basin in Wyoming³⁸, a rail distance of about 1200 miles from Chicago. The water related savings of \$48.28 is 2 ½ times the actual average rail transportation costs of \$19.13. The Corps savings estimate for water transportation is simply not plausible. It is further interesting that the 2014 GLMRIS Report calculated coal transport savings by barge at only \$16.05 per ton---thus, barge saves three times as much in 2017 as it did in 2014.

Grain is another commodity where transportation rates are readily available from the U.S. Department of Agriculture. They publish a weekly transportation rate report for both rail and barge modes. The report for the week of September 19, 2017 shows southbound barge rates from the Illinois River at \$20.18/ton. It is presumed that most of these movements are downbound to the Gulf of Mexico. The Department of Agriculture also publishes weekly rail rates for unit and shuttle train shipments from selected origins and destinations nationwide. These rates vary from about \$40/ton for trips in the 600-800 mile range to about \$50/ton for longer trips. More detail is provided by the American Association of Railroads that shows that the nationwide average for moving farm products is \$39.71/ton³⁹. The Corps water related savings of \$44.15/ton for grain is more than the average cost of a farm products related rail

³⁶ The coal category includes coke.

³⁷ U.S. Energy Information Administration, Form EIA-923. Table 2. Real Average Annual Transportation Costs, By Primary Transport Mode and Supply Region (2015 dollars per ton)

³⁸ A rate of \$25/ton for coal from North Dakota to Chicago (about 1000 rail miles) was quoted in a telephone call to the authors.

³⁹ American Association of Railroads, Railroad Facts, 2016 Edition. Page 32.

movement---this makes no sense. Barge movements are less expensive than rail movements but the difference is much less than the \$44.15/ton assumed in the Corps report.

Aggregate traffic moving through the BRLD is estimated to save \$24.88/ton compared to the cost of other modes. In Appendix D, the Corps states that:

*“Aggregates traffic moving through BRLD is dominated by sand and gravel, and limestone, with smaller quantities of gypsum and other materials. In contrast to iron and steel, which are moved about the country, aggregate traffic typically stays in the CAWS region and supports construction activities in the Chicago area.”*⁴⁰ (Emphasis added)

Aggregates represent some of the least expensive and most readily available commodities almost anywhere in this country. Sand and gravel can be purchased from many aggregate dealers for as little as \$10/ton---others types of aggregates may be somewhat higher⁴¹. It is a bit of a puzzle how this inexpensive readily available commodity moving primarily within the Chicago region can save users almost \$26/ton because it travels by barge. We also note that the 2014 GLMRIS report estimated cost savings for aggregates of only \$9.34⁴²---quite a large difference in just three years.

It is further puzzling that the transportation of “iron and steel”, perhaps one of the most expensive commodities (with possible exception of scrap metal), has the least savings of only \$3.16/ton. It is especially puzzling that in the quotation cited above it states that “iron and steel is moved about the country.” So we have a situation where aggregate traffic moving only short distances has a saving associated with barge transportation of about \$26/ton whereas iron and steel moving much longer distances only saves about \$3/ton when moving by barge.

The 2017 GLMRIS report estimates that movement of crude petroleum by barge saves \$78.64/ton. They show a savings of \$26.50/ton for refined petroleum. Since a ton contains

⁴⁰ GLMRIS-BR. Page D-46.

⁴¹ U.S. Geological Service, Mineral Commodities, 2016. The average price of construction sand is \$8.80/metric ton and crushed stone is \$10.98/metric ton.

⁴² 2014 GLMRIS Report. Page D-675.

about 6 barrels ⁴³ this amounts to \$12.58 savings per barrel-----quite a lot since crude oil has been selling for between \$45-55/barrel for the past 6 months or so. The U.S. EIA expects that crude oil will average \$50/barrel through 2018.⁴⁴ Since we do not know the origin or destination of petroleum products moved through BRLD it is difficult to make a comparison with other modes such as rail or pipeline. However, data is available from AAR⁴⁵ that shows the average railroad cost of moving crude petroleum is \$55.12/ton and refined petroleum is \$52.23/ton. Pipelines would be even less expensive. It seems unlikely that barge transport could save 1 ½ times more than the average rail price for crude petroleum of \$55.12. Cost savings of \$78.65/ton by barge implies a total cost of \$118/ton⁴⁶ by some another mode such as rail. This is preposterous when the average rail cost for crude petroleum is only \$55.12/ton and this often involves very long trips.

The examples of estimated cost savings assumed by the Corps and just discussed make little sense and would not happen in the real world. We suspect that the major reason for these unusual cost savings is caused by the Corps insistence on continuing to use the same origins and destinations for the traffic movement. However, we cannot explain the large differences in savings for different commodity groups between the 2014 and 2017 GLMRIS reports. This raises major questions as to the methodology that was used. Since the railroad industry is the principle competitor for the longer distance movement of bulk commodities it was decided to more systematically compare the Corps cost savings to rail costs.

Table 6 compares commodity cost savings calculated from the GLMRIS-BR study to railroad revenues on a tonnage basis. Both sets of costs are averages---the average cost savings for traffic moving through the BRLD and the railroad average cost/ton associated with the movement of a commodity. This at least provides a consistent basis to consider whether the

⁴³ Approximately 6 barrels/ton..

⁴⁴ USEIA article dated July 31, 2017. Brent and WTI crude oil prices are expected to average \$50 per barrel through 2018.

⁴⁵ Association of American Railroads, Railroad Facts, 2016 Edition.

⁴⁶ \$118/ton is based on barge savings of \$78.65 and the barge cost which is assumed here as an example to be about \$40/ton.

Corps estimates of cost savings seem reasonable. Our conclusion is that the Corps estimates are unreasonable and illogical. The GLMRIS-BR transportation cost ‘savings’ range from \$3/ton to \$78/ton---the average savings is \$27.72/ton. Conversely, how to explain that the movement of iron and steel by barge only saves \$3/ton and all others save about \$8/ton. We understand that different commodities may move different distance by rail and barge but these kinds of differences defy explanation.

TABLE 6
COMPARISON OF AVERAGE RAILROAD REVENUE PER TON TO GLMRIS SAVINGS PER TON

2015 U.S. Rail Tonnage and Revenues from AAR				GLMRIS
Commodity	Rail Tons Originated (000)	Rail Gross Revenue (millions)	Rail Revenue per Ton (dollars) ⁴⁷	GLMRIS Savings/Ton (dollars)
Coal	638,053	\$12,124	\$19.02	\$48.78
Petroleum	49,892	\$2,606	\$52.23	\$26.50
Chemicals	179,671	\$10,117	\$56.38	\$26.50
Ores And minerals	219,153	\$3,963	\$40.59	\$24.89
Crude Petroleum	40,478	\$2,231	\$55.12	\$78.65
Aggregates	42,846	\$932	\$40.59	\$24.89
Grains	145,492	\$5,777	\$39.71	\$44.15
Iron and steel	45,738	\$2,417	\$52.84	\$3.16
All others	370,052	\$30,486	\$82.38 ⁴⁸	\$8.45
Total	1,731,375	\$70,653	\$40.80	\$27.72

Source: Columns 2-4 from Association of American Railroads. Column 5 from Table 5 of this report—calculated from USACE data.

Further demonstration that these savings are too high lies in the concept of market based pricing. That is, why would a barge company transport commodities so much cheaper than other modes of transportation. All modes carefully study their competition and price their services so they maximize their revenue while still undercutting the competing mode. Travel time, terminal locations, transloading needs and other considerations also enter into a pricing decision.

⁴⁷ Revenue in this instance is assumed to represent the price or cost associated with moving one ton of a commodity. Revenue to the railroad is cost to the buyer of the rail service.

⁴⁸ The all other category shown here for rail includes high value/low weight rail traffic such as intermodal containers and the transport of finished automobiles. These are time and service sensitive and warrant a much higher rate than bulk commodities.

In part, barge transportation is less expensive than rail or truck because of major contributions from the federal government. The federal government typically pays 100 percent of construction costs and 100 percent of operations and maintenance costs for inland waterway projects. Half of construction costs are paid out of the Inland Waterways Trust Fund which in turn is funded through a diesel fuel tax of 20 cents per gallon. The federal government funds the other half from general funds.

“The federal government, through general revenues pays more for water transportation as a percentage of total O&M and construction costs compared with federal contributions to highways and rail. For the inland waterways system, federal support is used to cover a large shortfall between the fees paid by users and total system costs. In contrast, fees paid by the users of highway and rail modes cover a much larger share of the capital and O&M costs of those transportation systems. General fund revenues pay about 90 percent of total inland waterway costs, including the construction, operations, and maintenance of barge navigation infrastructure. This compares with virtually no federal general revenue support for rail system users and pipeline, and historically only about 25 percent for highways, which are primarily derived from user fees.”⁴⁹

7. ALTERNATIVE COST ESTIMATES BASED ON RAIL REVENUES

In order to assess the reasonableness of the Corps transportation cost savings the authors developed two alternative scenarios. The first is shown here in Section 7 which calculates overall cost savings based on the assumption that average rail costs are typically higher than average barge costs. The second approach is shown in Section 8 which compares costs when shippers and receivers respond in various ways to closure of the lock.

As stated previously, the authors could not reconcile many of the tonnage savings shown in Table 2---the large difference between the \$78.64/ton savings used for crude petroleum and the \$3.16 used for iron and steel made little sense nor did they reflect our experience with transportation costs on either a ton mile or a ton basis. The primary competitor for typical barge commodities for the medium and longer distant trips⁵⁰ is the rail industry. We obtained

⁴⁹ National Academy of Sciences. Transportation Research Board Special Report 315. Funding and Managing the U.S. Inland Waterway System: What Policy Makers Need to Know. 2015. Pgs 84-85.

⁵⁰ Trucks would compete for shorter trips such as those within the Chicago region.

average rail rates per ton for various commodities from the Association of American Railroads.⁵¹ Barge transportation is generally less expensive than rail so the assumption was made that the average barge rate was 30 percent lower⁵² than the average rail rate—thus, the difference is the cost savings associated with the barge movement. We did not account for the fact that the average rail journey at 1008 miles⁵³ is typically longer than the barge movement so a case could be made that a 30 percent price difference in favor of the barge industry is much higher than it should be. Most rail movements are quite long whereas the inland waterway industry has a mix of both short and long distant services---some shorter distant movements are quite common in the Chicago study area.

The results of this exercise are shown in Table 7.

TABLE 7
ALTRNATIVE COST SAVINGS BASED ON RAIL COSTS
(ASSUMES BARGE COSTS 30% LESS THAN RAIL)

Commodity	Revised Tonnage Estimate	Railroad Average Cost/Ton	Calculated Barge Saving/Ton at 30% Less/Ton Than Rail	Total Savings— Authors Estimate
Coal	800,000	\$19.00	\$5.70	\$4,560,000
Petroleum	1,219,692	\$52.23	\$15.67	\$19,111,354
Chemicals	1,334,498	\$56.31	\$16.89	\$22,543,675
Ores and Minerals	746,952	\$18.08	\$5.42	\$4,051,468
Crude Petroleum	314,728	\$55.11	\$16.53	\$5,203,398
Aggregates	1,409,335	\$21.76	\$6.53	\$9,200,139
Grains	396,339	\$39.71	\$11.91	\$4,721,587
Iron and Steel	2,317,495	52.84	\$15.85	\$37,584,886
All Others	1,460,961	\$40.81	\$12.24	\$17,231,643
Total	10,000,000	\$40.81	\$12.42	\$124,208,149

⁵¹ Association of American Railroads, Railroad Facts, 2016 Edition. Page 32.

⁵² U.S. Bureau of Transportation Statistics, Transportation Statistics Annual Report, 2016. Table 3-21. This table shows barge rates 22% lower than rail rates in 2004---the last year barge rates were available. Rail rates are available through 2014. We were very conservative and we assumed that barge rates would be 30% lower than rail rates even though average rail trips are longer than barge trips.

⁵³ Association of American Railroads, Railroad Facts, 2016 Edition. Page 39.

This exercise resulted in rail costs being \$5-17 per ton greater than barge costs. Telephone conversations with rail and logistics personnel indicated this range was reasonable depending on the commodity and distance involved. In fact some studies have shown that rail is quite competitive especially for the longer trip.⁵⁴

This shows total transportation savings by using barge, and compared with rail, of \$124.2 million. We suspect that the accuracy of this approach will vary depending on the commodity but it does represent a consistent approach to evaluating savings. Our sense is that coal transport savings may be a little on the low side whereas iron and steel may be on the high side. We note that the savings shown here are in two instances higher than the Corps savings--- iron and steel and all other.

8. ALTERNATIVE COST ESTIMATES BASED ON SHIPPER AND RECEIVER RESPONSES TO LOCK CLOSURE

Our second approach to assessing additional costs associated with closure of the lock involves estimates of on how shippers and receivers would react.

In 2010, we calculated, in a report we produced, a range of \$63-\$69 million in additional transportation costs based on seven million tons of traffic impacted by barriers at more upstream locations. In 2014, we calculated that a physical barrier at Alsip on the Calumet-Sag Canal and a physical barrier at Stickney on the Chicago Sanitary and Ship Canal would impact about ten million tons of traffic and result in additional transportation costs in the \$100 million range.

The approach utilized in the current estimate represents a similar but updated version our 2014 analysis. It assumes that shippers and receivers of cargo would respond in the most rational, efficient, and cost effective manner to changes in the waterway system. It recognizes that most

⁵⁴ Inland Navigation in the United States; University of Kentucky and University of Tennessee, November 2014. Page 93. Table shows barge costs for soybeans from Iowa to the Gulf of \$20.97 and rail costs to the PNW of \$29.74. The rail distance is almost twice as far yet the cost is only 41% higher. It also shows barge costs of \$17.40 from Illinois to the Gulf and rail costs of \$21.99 to the PNW---in this case rail is only 26% higher for a much longer trip.

of the cargo on the waterway system is “commodity” traffic--that is, most of it is not unique in form or character from like commodities (e.g., corn, wheat, stone, coal, salt, scrap metal, pig iron, most chemicals, and most petroleum products). It recognizes that similar commodities can usually be obtained in most parts of the country from several sources at roughly similar prices and that there is a certain market equilibrium price for these commodities.

Our approach assumes that traffic currently moving by barge would move as follows if the BRLD is closed:

- a. Continued use of barge transportation for a portion of the traffic to and from the Chicago area, downriver from the BRLD, with a truck transload for pickup and delivery.
- b. Use of trucks for movement of former local barge movements.
- c. Use of the rail mode as a partial substitute for the waterborne move.
- d. Some resourcing of commodities based on competitive pricing.

We understand from the 2014 report that about half of the traffic is long distance traffic and we split this between a. continued barge with transload and c. use of the rail mode. Our survey revealed significant opportunities for b. truck in lieu of local barge and we assumed 20% for that category. The balance of 30% was assigned to d. resourcing of commodities based on competitive pricing.

8.a. Continued Use of Barge Transportation with A Truck Trans-load--25% of Traffic

We believe the Corps’ approach is fundamentally flawed. It assumes that since the barge cannot travel the last few miles in a trip the cargo would be shifted in its entirety to the rail or truck mode for the entire distance of a trip. Thus, a cargo from New Orleans to the Chicago area is assumed to shift to rail for the entire trip from New Orleans. Such an assumption is not economically realistic. We do not believe that the inland waterway industry would just acquiesce to losing large volumes of high revenue traffic. We understand that about half of all

CAWS barge traffic⁵⁵ is to or from points on the Lower Mississippi River or the Gulf of Mexico. A single barge could generate substantial revenues for a 1350+/-mile⁵⁶ trip between the Chicago area and New Orleans. An upward bound barge could get within 50⁵⁷ miles of most former destinations --thus more than 96% of the trip could continue to be by barge. We believe that there are sufficient cost advantages in barge transportation that significant amounts of longer distance traffic would continue as a water move. These cost advantages appear adequate to support some additional costs for transload handling and movements by other modes.

A major difficulty in reviewing the Corps work is the total lack of any data relating to origin-destination pairs, overland routes assumed, mode, or rates that were utilized. This is compounded by the Corps insistence on utilizing existing origin-destination pairs even if this would not happen in the real world. Existing O-D pairs are those in which the waterway system has an advantage in being less expensive than other modes of transportation. It appears that a lot of the complexity involved with actual transportation decisions is lost because of the Corps process. However, we do not have any of the detail that they use in making their calculations. It seems that a lot of data from different sources is entered into their model which then provides output that makes no sense. Their justification for continuing to use existing origins and destinations appears to be that they are required to do it that way. They also acknowledge that their models were designed to support waterway investments such as lock improvements and were not designed for a situation involving closure of a lock.

Transportation networks were established in a manner that provided acceptable service at the lowest cost. They usually involve combinations of rail, water and highway. Rarely do barges provide service from the ultimate origin to the ultimate destination---usually some combination of rail, highway and barge is used to fulfill the need. We assume that the cost advantages of barge transportation are such that some cargo will continue to use the waterway system. Barges will stop at or near the physical barriers at existing or new terminals and cargo will be

⁵⁵ 2014 GLMRIS Report.

⁵⁶ BRLD is about 1375 river miles from New Orleans.

⁵⁷ It is about 47 river miles from BRLD to Lake Michigan.

transferred to trucks for local delivery. In many cases, there is no additional handling if cargo was formerly transferred between truck and barge at another location. We assume that 25 percent of all traffic would be transloaded. This would likely be longer distance traffic which represents about half of the barge traffic. This could include higher value traffic such as chemicals, petroleum and iron and steel.

Depending on location, such terminals would be up to 50 highway miles from existing users. However, many terminals such as those in the Lemont area are much closer—about 15 miles. For purposes of this analysis, the authors chose to use 25 one-way miles as an average distance between a terminal downriver of BRLD and an upriver user, meaning that a 50-mile round trip would be required for a truck move from a new or existing transload terminal to a user. There are variations on this theme as well although we have not calculated the costs involved. One involves construction of a pipeline from a BRLD downriver terminal to refineries and other terminals in the Lemont area. There also may be the possibility of a pipeline transfer between the downriver and upriver side of the barrier.

In 2010, 2014 and 2017, the authors conducted a number of interviews with existing terminal operators and/or those familiar with costs in the Chicago area. We also observed and timed loading and unloading operations. These earlier values have been reviewed and updated to reflect current costs.⁵⁸ Our basic assumptions are the following:

- Truck operating costs of \$120/hour⁵⁹
- Truck load of 25 tons
- Truck average speed of 25 mph
- Truck delivery cost of \$9.60/ton based on 50-mile round trip (50 miles at 25mph=2.0 hours@ \$120/hour/25 tons=\$9.60/ton)
- Additional handling costs for transload of \$7/ton (includes truck wait time, other equipment, operator time, etc.)⁶⁰

⁵⁸ Phone calls were made to a number of railroads, barge operators, local terminal operators and bulk distribution companies.

⁵⁹ A source in the Chicago area said costs ranged from \$105-\$120 per hour. Another published source is \$95/hour.

⁶⁰ A review of publicly available sources show 2017 hauling charges for a 20-mile trip of \$6.85/ton which includes loading the truck. Other sources show the cost of certain products such as sand or limestone in the \$6-20 range. This does not represent an exhaustive search but provides a general sense of pricing. The values used in our estimate are considerably higher than the examples shown.

We assumed that the average handling cost for transloading would be \$7 per ton and built in costs for our projected traffic. This assumes truck wait time, equipment and operator time, paperwork time, and other costs for loading the truck and then unloading the truck. This may be somewhat high for certain commodity types such as sand, coal, coke, or grain and somewhat low for steel or other products requiring specialized equipment and careful handling. It is important to understand that many movements will not require any extra handling at all and this is also factored into our weighted average handling cost of \$7/ton. For instance, a commodity may be offloaded to a truck at a transload facility and moved directly to an end user (e.g., construction sand or steel). The transloading that formerly occurred at a terminal upstream of the proposed barrier has simply been moved to a transload facility downstream of the proposed barrier. Thus, the \$7 per ton handling cost represents a blending of some higher cost transloads, some lower cost transloads, and recognition that some commodities would require no additional transloads at all. There may be additional trucking costs but we have built these into the analysis separately from handling costs.

In developing our handling cost estimates we assumed truck waiting time costs at \$120/hour, and equipment costs at \$125/hour which we believe to be reasonable. We assumed a generous value of 15 minutes of loading time, plus truck wait time, plus unloading time for the handling costs. By comparison, we observed that for bulk commodities such as salt, that a truck could be loaded every two minutes with the use of two front-end loaders. So again, our time estimates represent weighted averages, and reflect the fact that some commodities will take longer to load/unload while others, like salt, will take considerably less time. However, our costs are purposely on the high side of likely costs.

In 2017, we discussed transloading costs with a number of experienced transportation professionals and they confirmed that using \$7 per ton as a weighted average was reasonable, and that our load and wait times and cost estimates were reasonable. Trucks were assumed to carry 25 tons of cargo which is typical given Illinois weight regulations.

Our assessment assumed that transloading would occur in several ways:

- Utilize existing or new terminals downstream of the BRLD.⁶¹
- Utilize private shipper owned facilities elsewhere in the region.⁶²

There are many existing terminals that could be used and that are currently in operation. Our review of the CAWS revealed a number of existing terminals, and locations that are vacant or underutilized and appear to offer availability. Interviews with several knowledgeable sources also supports the view that the market is very dynamic, and that existing and new terminals would rapidly respond and provide needed services.

Our analysis of this option assumed that 2,500,000 tons of cargo would continue to use barge transportation to and from a point downriver of the BRLD. It would be transloaded and moved by truck to and from locations in the Greater Chicago area. A total of 2,500,000 tons would be involved at a total additional cost of \$41,500,000. This results in additional costs of \$16.60/per ton.

8.b. Local Trucks As A Replacement For Short Distance Barge Movements--20% of Traffic

There are some short barge movements in the Chicago area that would be uneconomic if a transload were needed. We assume that 20 percent of this traffic would switch totally to truck and the remainder would involve a different supply chain scenario. There should be little, if any, additional transload or handling costs since the cost to load and unload the barge would offset any additional costs to load or unload the truck. That said, we have assumed \$7/ton cost for any additional transload or handling costs that might be involved. This option assumed that 2 million tons of former barge cargo would move entirely by truck to and from locations in the

⁶¹ Terminals on the Lake Michigan side of the barriers will generally not be required since that cargo would typically be trucked from the shipper to the downriver terminal.

⁶² We talked to one large shipper in the Chicago area who has developed a contingency plan to use existing vacant waterway property downstream on the Illinois River to transload cargo between barge, and truck and rail in the event the waterway is closed.

Greater Chicago area. There would be additional costs of \$27,200,000. This results in additional costs of \$13.60/per ton.

8.c. Use Of The Rail Mode As A Partial Substitute For The Barge Movement--25% of Traffic

Some longer distance barge traffic is expected to shift to rail. We assume 25 percent which coupled with the 25 percent that continues to use barge results in 50 percent of the traffic. This rail move could include petroleum products, chemicals, iron and steel products, grain, coal, and stone. All of these commodities commonly use the rail mode. In fact, major rail commodities are also typical of cargo moved over the inland waterway system. Table 6 shows the similarity of rail commodities with those carried on barges and estimates that, on average, rail costs would be \$12.42 per ton greater than barge transportation. As discussed in Section 7, this assumed that rail rates would be 30 percent higher than barge rates. This option involves 2,500,000 tons of traffic and additional costs of \$31,050,000.

8.d. Resourcing Of Commodity Based On Competitive Pricing--30% of Traffic

This assumes that the loss of the inland water transport option will cause commodity suppliers and purchasers to find other competitively priced alternatives. The Chicago area represents one of the largest economies in the world. As such, there is a wide range of buyers and sellers offering goods and services at competitive prices. Sophisticated logistics and transportation services exist to serve this economy. In fact, Chicago has been long been known for being America's transportation center. The system is resilient and competitive alternatives are available to address any changes. Change is a constant with today's supply chains and logistics personnel regularly deal with worldwide transportation and supplier issues. The earlier 2014 GLMRIS Report recognized that there are alternatives to the waterway beyond just shifting to truck or rail. The report states that: "If commodities are not able to move on the waterway, then shippers would shift to truck or rail, *find alternative sources for input, sell their output in different markets, or shut down.* (Emphasis added.)"⁶³ There was however, no effort

⁶³ 2014 GLMRIS Report, page. D-692.

undertaken in the 2014 or 2017 GLMRIS reports to assess the feasibility of this resourcing or to determine cost impacts. We believe that resourcing is especially significant with respect to very low value cargoes. This option involves 3,000,000 tons of traffic and additional costs of \$15,000,000.

None of these alternatives are mutually exclusive. Some traffic could involve combinations of truck, transload, rail and resourcing.

Our assessment, as shown in Table 8 indicates that additional annual transportation-related costs of \$114.8 million could be expected. This amounts to an additional \$11.48 per ton over existing costs. The ultimate consumer of the commodity is expected to incur additional costs in this general range. It is quite possible that costs could be lower based on more resourcing than we have assumed in our analysis.

9. TRANSPORTATION COST FINDINGS

The Corps estimates that the lock closure will result in \$318.7 million in “lost transportation cost savings” if cargo cannot travel between existing origins and destinations on the waterway system. The authors reviewed the Corps approach to transportation cost savings utilizing two different approaches. The rail rate based approach discussed in Section 7 indicated additional costs of \$124.2 million and the shipper response approach discussed in Section 8 resulted in additional costs of \$114.8 million. Both results are far less than the Corps values as shown in Table 9---in fact, our analysis indicates that the GLMRIS report overstates by 2 ½ times the cost savings associated with barge service. In fact, we suspect our values may be on the higher side of what would actually occur. An additional \$11-12 per ton for transportation costs may result in even more resourcing of product in order to be competitive in the commodities marketplace.

We also remain troubled by the large variation in cost savings that the Corps uses for the different commodity groups. Some of the amounts defy any reasonable explanation and the barge savings alone sometimes greatly exceed the entire cost of other modal options.

Our analysis indicates that the Corps estimate of \$318 million of transportation cost savings associated with existing barge services is a value without meaning or relevance.

TABLE 8
TRANSPORTATION COST IMPACTS ASSOCIATED WITH SHIPPER AND RECEIVER ACTIONS

	Traffic (Tons)	Costs (Millions)	Costs/Ton (Dollars)
USACE Estimate	11,497,950	\$318.7	\$27.72
Authors Rail Based Estimate	10,000,000	\$124.2	\$12.42
Authors Shipper Response Estimate	10,000,000	\$114.8	\$11.48

This number in no way represents additional costs that would be incurred by commodity shippers or receivers that live and die by being competitive in the marketplace. It is a misleading and erroneous number having no legitimacy in the real world. It is supposedly a number that represents additional costs associated with moving existing barge cargo by rail or truck from existing origins and destinations by an overland route---a convoluted route apparently given the additional costs the Corps suggests. The bottom line is that if there are significant additional overland route costs from existing origins the cargo would move in some other manner from some other supplier at a cost that makes it competitive in the marketplace--nobody would pay an additional transportation cost of \$25/ton for aggregates for a product that may sell for \$10-15/ton. Nor would anyone pay \$48/ton in addition to the barge rate for the transport of coal when the average U.S. rail cost is only \$19/ton and the average delivered price of coal is only \$40/ton including both the coal cost at the mine and the rail transportation cost. It is very unfortunate that the Corps flawed concept of transportation cost savings appears to be driving a decision that could be disastrous for the Great Lakes.

10. REGIONAL ECONOMIC IMPACTS

The Corps utilized several models to evaluate regional economic impacts in the Chicago Combined Statistical Area⁶⁴ associated with the different alternatives. They did not focus on short term impacts nor did they consider “long term impacts from changes in cargo handling at ports due to shifts in transportation use.” With respect to this they stated ...”this will be largely

⁶⁴ CCSA includes thirteen counties surrounding Chicago including eight in Illinois, four in Indiana and one in Wisconsin.

negligible at the macroeconomic scale, as shippers reducing the use of the port will likely shift to alternative modes of transportation.”⁶⁵

The Corps focused on long-term impacts in the production and utilization of commodities transiting BRLD. Model output for the lock closure alternative showed a loss of \$13.8 million in sales, the loss of 45 jobs, the loss of \$3.1 labor income and loss of \$5.6 million in Gross Regional Product.⁶⁶ The report states:

“Under all scenarios, the expected impact appears to be marginal in contrast to the size of the market. This reflects that while BRLD may be vitally important to the businesses that use it to ship or receive goods, its contribution to the overall Chicago CSA economy is relatively small.”⁶⁷

11. ALTERNATIVE SELECTION AND EVALUATION PROCESS

A major concern with the GLMRIS-BR report is that it was prepared using USACE directives, guidelines, and models that were designed to justify and evaluate inland waterway navigation projects. Waterway and related navigation and transportation impacts are the principle focus. There is frequent reference to approved models, procedures and guidelines along with appropriate citations. The report also suggests that these processes are most often utilized to evaluate inland waterway expansion projects such as new locks---they were not designed to evaluate closure of an existing lock. It is interesting that the stated planning objective is to: “prevent the upstream transfer of ANS from the MRB to the GLB through the CAWSD in the vicinity of the BRLD through the planning period of analysis.”⁶⁸ However, the Corps indicates elsewhere that: “The tentatively selected plan is the alternative that reduces the risk of Mississippi River Basin ANS establishment in the Great Lakes Basin to the maximum extent possible *while minimizing impacts to waterway uses and users.*”⁶⁹ (*Emphasis added*). The emphasized addition to the study purpose seems to bias the study towards selection of an alternative that allows continued use of the waterway system.

⁶⁵ GLMRIS-BR. Page D-84.

⁶⁶ GLMRIS-BR. Table 31. Page D-87.

⁶⁷ GLMRIS-BR. Page D-87

⁶⁸ GLMRIS-BR Main Report, Page 45.

⁶⁹ GLMRIS Report brochure. Also restated slightly differently on page ES-1 of the main report.

The cost-benefit analysis and the evaluation criteria⁷⁰ compare the likelihood of ANS moving from the Mississippi River Basin to the Great Lakes Basin against only USACE categories of costs such as project construction, operations and maintenance. The “cost of impact to navigation” value is greatly inflated as we have discussed. However, a larger issue is that potential costs associated with Asian Carp or other ANS becoming established in the Great Lakes is not even a part of the summary evaluation matrix. The Corps states that there has been insufficient work done on this topic except in Lake Erie and that no comprehensive data exists. That said, one could convene panels of experts to at least provide an order of magnitude estimate of these costs. It seems likely that invasion of the Great Lakes Basin by additional ANS including Asian Carp would come with enormous cost. Recognition of these costs in any sort of alternative evaluation matrix would almost certainly lead to a decision whereby the most effective alternative –lock closure—would be selected and quickly implemented.

12. SUMMARY AND CONCLUSIONS

The GLMRIS—Brandon Road report recommends the Complex Noise with Electric Barrier Alternative. The report relies almost entirely on impacts to navigation as the principal reason for their decision.

a. Navigation impacts are greatly overstated. The Corps assumes Target Tonnage of about 11.5 million tons based on 2012-2014 traffic levels adjusted to compensate for differences in the numbers obtained from the WCS and LPMS data systems. Our review used more recent data which includes 2015 and 2016 LPMS data. This shows that traffic declined by over 11 percent since 2014. A review of national and Illinois Waterway System data also shows that traffic declined during this period and is part of a continuing long term decline in waterway usage across the country.

b. Traffic is projected, by the Corps, to increase to 12.05 million tons in 2020, 12.2 million tons in 2030 and 12.4 million tons in 2040 and will remain at that level until 2070. The Waterway Traffic Demand Projection⁷¹ had a complete absence of any tabular information related to

⁷⁰ GLMRIS-BR Main Report. Page ES-13 and elsewhere. GLMRIS-Brandon Road Alternative Evaluation Criteria.

⁷¹ GLMRIS-BR. Appendix D-Economic, Attachment 2.

different commodity groups so it is impossible to determine how the different commodity groups would increase or decrease. Furthermore there was absolutely no discussion about major commodity groups like coal and little about agricultural products---two of the major groups that use the waterway system. Our short to medium term estimate is that tonnage through the BRLD will be in the 10 million ton range and that any increases in certain commodity traffic will be offset by declines in coal and petroleum traffic. This traffic level is very similar to recent experiences. Competition from less expensive natural gas and environmental regulations are causing power plants to shift away from the coal and the ongoing construction of pipelines is impacting the transportation of petroleum products by barge and rail.

c. The Corps greatly overstates the cost impacts of diverted traffic. Their report shows that closure of BRLD would result in \$318.8 million of “lost transportation savings.” This is defined, in part, as the additional cost that would be incurred by switching to the least expensive overland mode such as rail or truck. It is important to note that the Corps provides zero support, details or references as to how they came up with these values. Traffic is assumed to have the same origin and destination. Our analysis of Corps data shows that commodities would be higher by \$27.72 per ton in the absence of barge service. These increases range from an increase of \$78.64 for the transportation of crude petroleum to an increase of only \$3.16 for iron and steel. We could not reconcile the large difference in the Corps values and could find little relationship when compared to average costs for rail transportation.

d. The authors undertook two approaches to assessing the reasonableness of the Corps information. We had no access to Corps origin destination information nor any data on average trip length so were confined to averages.

- Costs based on a comparison with average rail revenues by commodity by ton (see Section 7). Barge costs were assumed to be 30 percent less expensive than rail costs on a per ton basis. Results showed transportation costs savings of \$124 million associated with barge transportation.
- Costs based on continued use of barge and transload, use of trucks for former local barge movements, use of the rail mode and resourcing of the commodity based on

competitive pricing (see Section 8). This exercise resulted in transportation cost savings associated with barge transportation of \$115 million.

These values are far less than the \$318.7 million assumed by the Corps. We were unable to find a source for the \$9.5 million additive apparently related to diverted traffic safety impacts that brought their total to \$328.7 million.

e. We agree with the Corps that the economic impacts cited in the report regarding lock closure would be relatively small and negligible at the macro-economic scale. That said lock closure is not without impact. Additional transportation costs of up to \$124 million would be incurred. There would also be considerable disruption of existing terminal and barge operations and some facilities would likely cease operation. This could happen in a short period of time and mitigation measures should be considered to facilitate the continued movement of cargo traffic into and out of the Chicago area. This could include construction of new downriver terminals that would accommodate transloading by truck, rail and pipeline to and from the upriver areas in the Chicago region.

f. Transportation impacts are the cost driver in the Corps evaluation matrix and there are no costs considered for Asian Carp and other ANS entering the Great Lakes. This seemingly invalidates the matrix. That is the major issue. However, a closer examination of the matrix raises other questions about the Corps decision. A comparison of the selected alternative (Technology Alternative---Complex Noise with Electric Barrier) and the Lock Closure Alternative as shown in Table 10 indicates the Lock Closure Alternative has the following advantages:

- Best protection against Asian Carp invasion---2% probability vs 13%.
- Lowest first costs by far---\$5.9 million vs \$275.3 million.
- Lowest annual construction cost---\$200,000 vs \$10.5 million
- Lowest annual non-structural costs---\$9.2 million vs \$11.3 million.
- Lowest annual OMMRR&R costs---\$20,000 vs \$8.2 million.
- Fastest implementation---2023 vs 2025.
- Least expensive for financing---\$5.9 million vs \$96.4 million non-federal costs

- Highest transportation and NED⁷² impacts---\$124 million⁷³ vs \$56.2 million.

It seems curious that on all measures except one, transportation and NED impacts, the Lock Closure Alternative is best but was not selected. This suggests that minimizing impacts to navigation is the paramount goal.

TABLE 10
CRITICAL ASSESSMENT OF GLMRIS-BR EVALUATION MATRIX

Alternative	Probability of Carp Establishment	Project First Costs	Average Annual Costs			Navigation Cost Impacts	NED Costs	Implementation Date
			Construction	Non-Structural	OMRR&R			
No Action	29%	N/A	N/A	N/A	N/A	N/A	N/A	Ongoing
Non-Structural	20%	\$600K	\$20K	\$11.5M	\$20K	N/A	\$11.5M	2020/2023
Electric Barrier	11%	\$266.8M	\$10.1M	\$11.3M	\$7.8M	\$31.4M	\$60.6M	2020/2025
Complex Noise	15%	\$113.9M	\$4.4M	\$11.3M	\$1.4M	\$26.0M	\$43.0M	2020/2025
Complex Noise/Electric	13%	\$275.3M	\$10.5M	\$11.3M	\$8.2M	\$26.2M	\$56.2M	2020/2025
Lock Closure	2%	\$5.9M	\$200K	\$9.2M	\$20K	\$124M	\$124M	2020/2023
Comparison	Best	Lowest	Lowest	Lowest	Lowest	Lowest	Lowest	Fastest

Source: Restated from Figure ES-6, Page ES-13 of Executive Summary. Highlights and comments by Taylor and Roach.

Comparison of **Complex Noise/Electric Alternative** and **Lock Closure Alternative**

Lock closure advantages:

1. Best protection against Carp invasion. Only 2% probability vs 13% with selected alternative.
2. Lowest first costs. \$5.9M vs \$275.3M.
3. Lowest annual construction costs of \$200K vs \$10.5M.
4. Lowest annual non-structural costs. \$9.2M vs \$11.3M
5. Lowest annual OMMRR&R (Operating, Maintenance, Repair, Replacement & Rehabilitation). \$20K vs \$8.2M
6. Fastest implementation. 2023 vs 2025
7. Highest navigation and NED costs (\$318M estimated by Corps. Authors estimate is \$115-124M).
8. Least expensive for financing. First costs require \$96.4 million in non-federal funds for selected alternative vs. only \$5.9 million for lock closure.

Summary of findings:

- Future traffic has been overstated (should be 10MT instead of 11.5 or 12MT).

⁷² NED (National Economic Development) costs as shown here and in the Corps matrix includes the Navigation Cost Impacts category plus an additional \$9.5 million to apparently account for safety cost impacts associated with switching to rail and truck transport. This table could be presented with only the NED column.

⁷³This is the highest of the author's estimate of \$117-124 million. Corps estimate is \$328 million.

- Costs of diverted traffic is greatly overstated (should be \$124M +/- instead of \$318M).
- Failure to include a reasonable damage cost to the entire GLB invalidates the process.
- Agreement with the report that regional economic impacts of lock closure will be negligible.

11 November 2017